

Letters to the Editor

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Increased Brain Cancer Risk in Physicians with High Radiation Exposure

From:

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Editor:

In their summary of historic exposures and health effects of medical radiation to workers in the November 2004 issue of *Radiology*, Dr Yoshinaga and colleagues (1) may have omitted one particular cancer site, the brain, where there are strong hints that physicians may have increased risk that could be associated with workplace radiation exposure.

Matanoski et al (2) found increased brain cancer mortality among radiologists from the 1920s and 1930s (compared with other physicians). Much more recently, Andersen et al (3) found brain cancer incidence in Scandinavia to be increased among physicians in general; they did not examine if this increase was concentrated among the most highly exposed specialists.

While radiologists may have been the most highly exposed medical workers before 1950, that distinction today may well go to cardiologists (their heads in particular) and other specialists who use fluoroscopy for interventional procedures. In one of the few comparisons of exposure according to specialty, British investigators (4) found average annual exposure rates of cardiologists to be twice those of radiologists (in 1993).

In Montreal, Renaud (5) showed annual exposures to cardiologists' heads in the 20–30-mSv range, depending on the number of procedures performed per year. Radiation from the fluoroscopy tube is scattered by the patient while the cardiac intervention is underway and can reach the physi-

Risk Estimates for Brain Tumors Among Three Cohorts of Medical Radiation Workers

Brain Tumor End Point	Exposed Group	Comparison Group	No. of Deaths or Patients with Brain Tumors	Measure of Radiation Exposure			Standardized Incidence Ratio
				Year of Registration	Employment Duration (y)	Measured Radiation Dose (mSv)	
Mortality	U.S. radiologists (5)	Physician specialists	NA	1920–1929	NA	NA	2.66*
			NA	1930–1939	NA	NA	2.10*
			NA	1940–1949	NA	NA	0.00*
Incidence	Chinese diagnostic x-ray workers (6)	Nonradiation medical workers	0	NA	<5	NA	0.0
			0	NA	5–9	NA	0.0
			2	NA	10–14	NA	1.2
			3	NA	15–19	NA	2.3
			2	NA	>20	NA	0.7
Incidence	Danish radiation therapy workers (7)	Danish population	0	NA	NA	0	0.00
			2	NA	NA	0.01–5.00	1.09
			4	NA	NA	5.01–50.00	2.23
			1	NA	NA	>50.00	1.08

Note.—NA = not available.

* Data are the rate ratio.

cian's head, which is often unprotected, even if a lead apron is worn to protect the torso. These exposures to the head are likely to be ongoing and are significantly higher than current exposures to workers in nuclear power or weapon plants or elsewhere in medical care.

This possible risk to exposed physicians requires further examination, since these professionals may be the only remaining large group of highly exposed workers of any type, especially if we focus on exposures to the head.

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Dr Yoshinaga and colleagues respond:

We thank Dr Wenzl for his letter, which suggests that medical radiation workers may experience an increased risk of brain tumors due to their occupational exposure to ionizing radiation. It is known that childhood exposure to ionizing radiation for treatment of benign diseases and high-dose cancer radiation therapy is associated with increased risk of brain tumors (1). More recently, follow-up studies of atomic bomb survivors provided evidence that adult or childhood exposure to radiation doses less than 1 Gy can increase the risk of tumors in the brain and other areas of the nervous system (2). In contrast, epidemiologic data on brain tumor risks among medical radiation workers and other populations occupationally exposed to ionizing radiation are limited.

Dr Wenzl pointed out that a statistically significant increased standardized incidence ratio was reported for brain cancer among physicians in the Nordic countries (3). While this observation is interesting, a single standardized incidence ratio should be interpreted cautiously because it could be increased or decreased as a result of chance, confounding, or bias. In the Nordic study, physician subspecialty was not known, so ionizing radiation exposure may not be related to the increased risk.

To augment what is known about brain tumors in medical radiation workers, we present brain tumor risks among the three cohorts reviewed in our article (4) (Table) for which surrogate measures of ionizing radiation exposure were available: U.S. radiologists (5), Chinese diagnostic x-ray workers (6), and Danish radiation therapy workers (7). The adjusted mortality rates for brain tumors among the U.S. radiologists who worked in the earlier two periods were increased, and data from the Chinese and Danish cohorts suggested a dose response but, on the basis of our analysis, they lacked statistical significance, possibly as a result of the small numbers. We therefore conclude that the association between ionizing radiation exposure and brain tumors among medical radiation workers is uncertain but that it is important to continue following these and other medical radiation workers.

Dr Wenzl states that because of the nature of the procedures they perform, cardiologists and interventional radiologists currently probably receive higher ionizing radiation exposures to the brain than most other physicians. Monitoring doses and providing special educational programs for workers in high-exposure professions would be prudent and might help reduce unnecessary exposure.

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